Molecular Biology

Title: ALTERED LEAF METABOLISM INS ALFALFA (*MEDICAGO SATIVA L.*) PLANTS OVER EXPRESSING NITROGEN ENRICHING MALATE DEHYDROGENASE FOR INCREASED ALUMINUM TOLERANCE.

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Abstract: Aluminum intolerance affects 30% of otherwise arable land worldwide. Although plants tolerate aluminum at alkaline and neutral pHs, a decrease in soil pH results in the formation of aluminum cation complexes, which include: aluminum (III) dihydroxide, aluminum (III) hydroxide, and a polynuclear aluminum species, $AlO_4Al_{12}(OH)_{24}(H_2O)_{12}^{7+}$. These complexes are believed to negatively affect root elongation and the overall health and growth rate of the plant. Conventional means of alleviating aluminum intolerance tends to be expensive or unavailable to certain regions of the world. With alfalfa (*Medicago sativa L.*) considered to be the most important forage crop for the United States and Canada, it was recently genetically modified for increased aluminum tolerance by increasing organic acid exudation. This was done by modifying the plasmid of A*grobacterium tumafacians* by adding a gene consisting of a CaMV 35S promoter from *Pseudomonas aeruginosa* and nopaline synthase (NOS) 3'terminator, for the production of the enzyme malate dehydrogenase (neMDH). While

increased tolerance to aluminum was confirmed, the metabolic changes in the plants remain unclear. The research presented here is the summary of growth measurements and photometric assays that characterize some of the biochemical changes occurring in the leaves of the modified alfalfa plants including activity of phosphoenolpyruvate carboxylase (PEPC), citrate synthase (CS), starch and glucose concentrations, and dry weight and growth comparisons.